Appendix H6

Selection of Management Goals, Endpoints, Measures, and Receptors

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Appendix H6

Selection of Management Goals, Endpoints, Measures, and Receptors

H6-1 BACKGROUND

Selection of management goals, assessment endpoints, receptors, and measures for the Idaho National Engineering and Environmental Laboratory (INEEL) Operable Unit (OU) 10-04 ecological risk assessment (ERA) constitutes the final step of the problem formulation step in the ERA process and the commencement of Phase 3 (Figure H6-1). Assessment endpoints are "explicit expressions of the actual environmental values that are to be protected" (EPA 1996). For ERA, assessment endpoints are the focus for risk characterization and link the measurement endpoints to risk management goals (EPA 1992).

H6-2 MANAGEMENT GOALS

Formal risk management goals were not previously defined for the OU 10-04 ERA. As required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA), the INEEL site-wide primary management goal is "protection of the environment" (EPA 1998). A suite of secondary management goals quantitatively or qualitatively evaluated in the OU 10-04 ERA has also been developed for each resource category.

Secondary management goals to sustain inherent values, goods, and benefits associated with INEEL vegetation resources include maintenance of the following:

- Plant community structure and habitat value
- Wildlife and livestock forage production
- Soil productivity, community structure, and stability
- Scientific, heritage, cultural values of INEEL plant communities.

Secondary management goals for INEEL wildlife resources include maintenance and protection of the following:

- INEEL threatened and endangered (T/E) and species of concern (individuals and populations)
- INEEL terrestrial wildlife community structure
- INEEL aquatic wildlife community structure and habitat value
- Integrity of INEEL wildlife prey base
- INEEL game species populations.

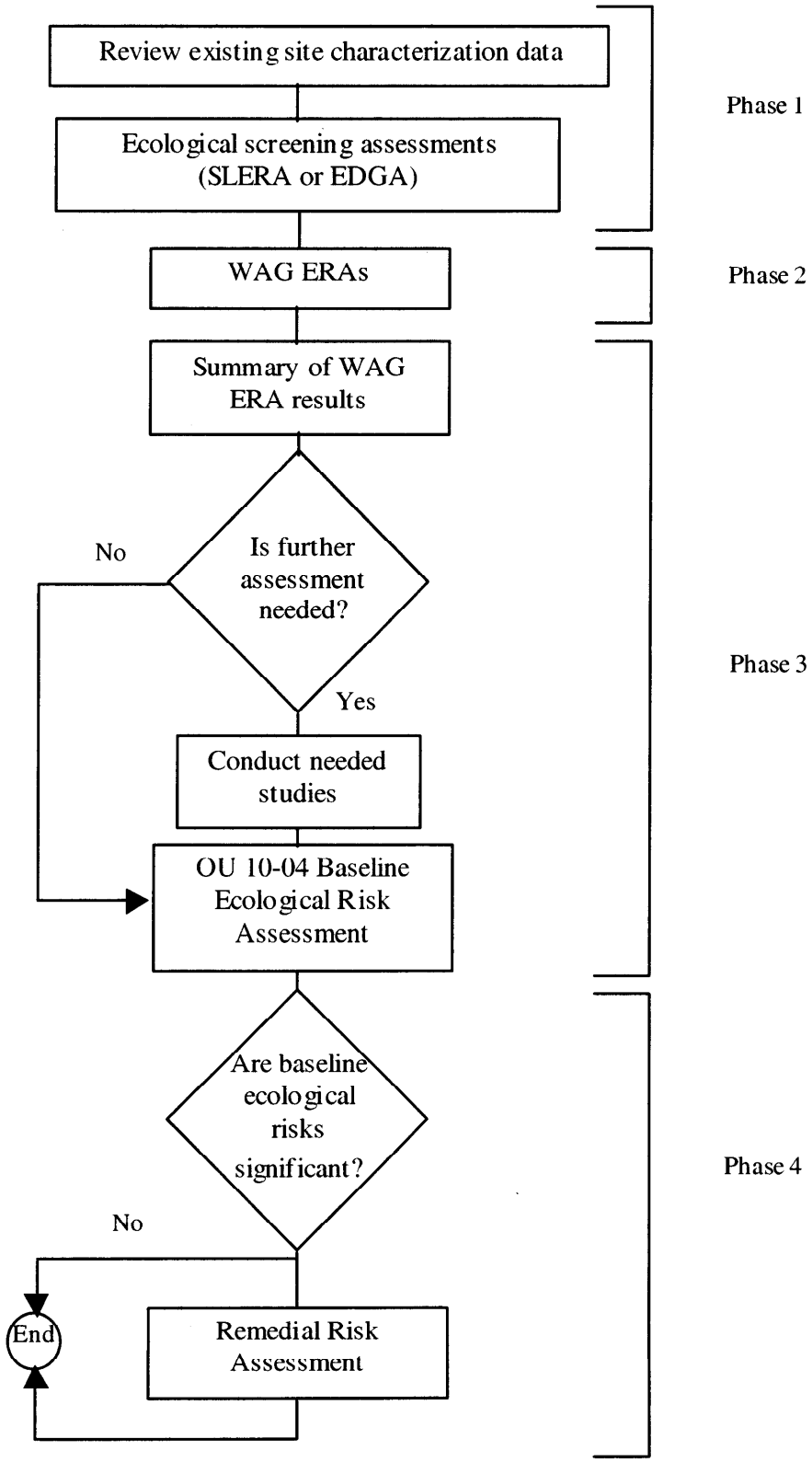

Figure H6-1. INEEL ERA Flow Diagram.

Proposed secondary management goals for INEEL landscape resources include the protection and maintenance of the following:

- INEEL unique and special habitats
- Migratory corridor
- National Environmental Research Park (NERP), National Important Bird Area.

A summary of INEEL resources, inherent values, and benefits as they relate to management goals and the ERA process is located in Attachment H6-1.

H6-3 ASSESSMENT ENDPOINTS

Three principal criteria are used to select ecological values that may be appropriate for assessment endpoints: (1) ecological relevance, (2) susceptibility to known or potential stressors, and (3) relevance to management goals (EPA 1998). For the purposes of this ERA, stressors are identified as those chemical and radiological contaminants released to the environment as a result of facility operations.

Two elements are required to define an assessment endpoint: (1) the valued ecological entity (e.g., a species, a functional group, an ecosystem function or characteristic, a specific habitat, or a unique place) and (2) the characteristic about the entity that is important to protect and potentially at risk (e.g., reproductive viability) (EPA 1996).

The assessment endpoints selected for the OU 10-04 ERA are as follows:

1. *De minimis* risk to INEEL plant communities as forage base for herbivores and upper trophic level receptors
2. *De minimis* risk to soil fauna communities that support plant communities and upper trophic level receptors
3. *De minimis* risk to INEEL terrestrial wildlife communities, T/E and species of concern
4. *De minimis* risk to INEEL aquatic wildlife communities, T/E and species of concern
5. *De minimis* risk to INEEL game species populations
6. *De minimis risk to INEEL prey* base.

These assessment endpoints represent components of scientific management decision points (SMDPs) (b) and (c) (EPA 1996), and reflect the general consensus of the risk assessment team. By adopting an approach similar to that presented in Suter et al. (1995), expressing endpoints in relation to *de minimis* risk provides a method for categorizing ecological risk in terms of remediation strategies. Such an approach is expected to be useful to risk managers.

De minimis ecological risk is defined as risk corresponding to (1) less than 20% reduction in the abundance or production of an endpoint population within suitable habitat within a unit area, (2) loss of less than 20% of the species in an endpoint community in a unit area, or (3) loss of less than 20% of the area of an endpoint community in a unit area. The term "unit area" refers to a discrete area that is at risk and may be subject to a regulatory or remedial action. Loss of more than 20% may also be *de minimis* if the community has negligible ecological value (e.g., a baseball field) or if the loss is brief because the community is adapted to physical disturbances (e.g., the plant communities of stream gravel bars) (Suter et al. 1995).

Assessment endpoints that cannot be linked with measurable attributes are not appropriate for risk assessment purposes. The term "measurement endpoints" was formerly applied to the linkage between assessment endpoints and measurable attributes.

H6-4 MEASURES

The Environmental Protection Agency (EPA) provided further clarification on "measurement endpoints," and made the distinction between "measures of exposure," "measures of effects," and "measures of ecosystem and receptor characteristics" (EPA 1998). These distinctions are useful in that measures of exposure (e.g., concentrations of contaminants of concern [COPCs] in source media) can be related directly to hazard quotients (HQs) and hazard indices (HIs) similar to human health risk assessment practices. A measure of effect is a study or datum that quantifies the negative impacts to the ecological receptors and the assessment endpoints. Although more difficult to quantify, measures of effects may be obtained through biometric studies, toxicity testing, micronucleus analysis, histopathology, or long-term monitoring. Measures are usually identified in the analysis plan; however, the process of developing endpoints and measures is an iterative process and often conducted in tandem with development of the site conceptual model (DOE-ID 1999).

"Measures of ecosystem and receptor characteristics" are measures of ecosystem characteristics that influence the behavior and location of entities selected as the assessment endpoint, the distribution of a stressor, and life-history characteristics of the assessment endpoint or its surrogate that may affect exposure or response to a stressor" (EPA 1998). This third measure is difficult to assess at the OU 10-04 level because the site-wide ERA includes multiple ecosystems and receptors, several of which overlap across the INEEL. In addition, the INEEL ERA commenced well before the 1996 EPA Superfund or 1998 guidance documents were published. The EPA 1996 guidance refers to "measurement endpoints," and only until the release of the 1998 document was the terminology changed to "measures." For these reasons, "measures of receptor and ecosystem characteristics" and "lines of evidence" are discussed together. Detailed information pertaining to receptors and many ecosystem characteristics is not currently available. Long-term monitoring and additional studies would be necessary to provide such types of information as abundance and distribution of suitable nesting sites, reproductive success, and availability and distribution of suitable habitat and forage/prey species. Other relevant data might include field measurements of natural reproduction, growth and mortality rates, feeding, resting and breeding behavior (EPA 1998). The need for additional studies will be determined pending the outcome of the OU 10-04 baseline ERA.

H6-5 RECEPTORS

The results of the Waste Area Group (WAG) ERAs, and the information compiled on INEEL ecosystem values, goods, and benefits (Appendix A) were used to identify individual species of concern to evaluate in the OU 10-04. Reflecting a more current philosophical approach towards ecology, the term "services " has since been replaced with "benefits" (Wyant et al. 1996). The results of this analysis are shown in Table H6-1.

The WAG ERA results indicate that mammalian receptors, in particular mammalian insectivores, are shown to be at risk from exposure to the greatest number of COPCs. Plant receptors are also shown as having the potential risk from exposure to a higher number of COPCs. Avian receptors, in particular avian carnivores, appear to be at risk for relatively fewer COPCs than are mammalian receptors in general.

Results of the WAG ERAs indicate that, with the exception of minor revisions to receptors for avian carnivore groups and receptors associated with aquatic pathways, no receptors may be excluded from being evaluated in the OU 10-04 ERA. Receptors and COPCs that cannot be assessed due to lack of

either toxicity data and/or exposure parameters (e.g., soil fauna, amphibians, and reptiles) are carried through the summary process and evaluated qualitatively in the OU 10-04 ERA.

The list of ecological receptors quantitatively addressed (where possible based on available exposure parameters and toxicity information) in the OU 10-04 ERA is shown on Table H6-1. These receptors are those indicator species initially identified in Table D1-3-2 in the OU 10-04 Work Plan (DOE-ID 1999). These indicator species were identified as part of the evaluation of ecosystem values, goods, and benefits (Attachment H6-1).

In order to simplify the OU 10-04 ERA, while incorporating large amounts of data, specific ecological entities have been identified as receptors, rather than listing only the functional groups to which the receptor belongs. In some cases, multiple functional groups are represented by a single receptor. The abundance and distribution of a species was considered in the selection of receptors. Rare receptors (e.g., gray wolf and black tern), and occasional or uncommon receptors (e.g., long-eared owl, bobcat, or barn swallow) were not selected since they are not primary components in the INEEL food web. Every attempt was made to include all functional groups; however, professional judgement also played a factor in receptor selection. A single species was sometimes chosen to represent several functional groups. The availability of pertinent toxicity data, exposure parameters, and site-specific data were key factors in the selection of primary receptors. Table H6-1 provides the applicable functional groups and endpoints associated with the particular receptor. This process allows for an easier method of quantifying risks to multiple receptors and pathways over a very large spatial area. A complete listing of the WAG ERA functional groups and species represented by those groups is located in Attachment H6-2.

The availability of population data presented on geographical information system (GIS) spatial distribution maps was an additional consideration when selecting a particular species to represent one or more functional groups. Risk estimates can be presented on a facility-wide basis for those receptors already represented by GIS maps, and assist in risk interpretation.

Since the OU 10-04 ERA must also address threatened and endangered (T/E), sensitive, and other species of concern, individuals as well as populations must be assessed. Since the WAG ERAs did not include additional uncertainty factors (UFs) in the derivation of final toxicity reference values (TRVs) for T/E and species of concern, as a conservative measure, selected T/E or sensitive species were chosen for the facility-wide assessment. Although no aquatic ecosystem were addressed per se in the OU 10-04 ERA, the blue-winged teal, an AV143 aquatic avian herbivore, was selected since it will be used to represent other aquatic species and species of concern (e.g., the trumpeter swan and white-faced ibis). The blue-winged teal, as well as other waterfowl and shorebirds, could be present at facility waste ponds and sewage lagoons, as well as other aquatic habitats on the INEEL.

Table H6-1 presents the assessment endpoints applicable to the ecological receptor, receptor-specific information, and rationale for inclusion or exclusion as the primary receptor selected to represent one or more functional groups. Assessment endpoints and their relation to measures are shown in Table H6-2. Calculation of exposure intakes and risk estimates were performed for the receptors identified under the "measures of effects" column based on the availability of environmental media concentrations, bioconcentration and bioaccumulation factors, exposure parameters and TRVs for the WAG 6 and 10 sites. Other pertinent information and data, which serve as additional lines of evidence in the quantitative anlysis, are also included in Table H6-2 and will be used to support the risk characterization.

Table H6-1. Ecological Receptors Associated with Assessment Endpoints.

Receptor *	Functional Groups Represented	Assessment Endpoint No.	INEEL Specific Data **	GIS Spatial Analysis or Other Distribution Maps **	Comment	Retained as a Primary Receptor?
Plants	All vegetation	1	Long-term vegetation surveys, plant tissue concentrations for metals and radionuclides (See attachment 9, in Appendix D of DOE-ID 1999); *I-129 concentrations (Morris 1999)*	INEEL-wide vegetation cover class maps	Also used to represent T/E and species of concern	Yes
Grasshoppers, beetles	Terrestrial invertebrates	2,6	Grasshopper and beetle tissue concentrations for metals and radionuclides (See attachment 9, in Appendix D of DOE-ID, 1999); Cs-137 and Co-60 in harvester ant nests (Blom et al. 1991).	Not applicable	Used to represent all terrestrial invertebrates including insects and all pollinators	Yes
Great Basin spadefoot toad	Amphibian (A232)	3,4	Not determined	*Environmental Science and Research Foundation (ESRF) "dot" distribution maps*	Used to represent all amphibians; lack of toxicity data and exposure parameters restrict evaluation of amphibians to qualitative discussion	Yes
Sagebrush lizard	Reptilian insectivores (R222)	3	Not determined	Preliminary interpretive map is likely available; *ESRF "dot" distribution maps*	Inclusion of reptiles is appropriate for a site-wide ERA; more common; used also to represent the gopher snake and other reptiles	Yes
Gopher snake	Reptilian carnivore (R322)	3	Rattlesnake and hibernacula surveys and monitoring (V. A. Cobb Ph.D. dissertation, 1994); *S. Cooper master's thesis*	None to date	Lack of toxicity data and exposure parameters restrict evaluation of reptiles to qualitative discussion; less common; selected sagebrush lizard to represent all reptiles	No

Table H6-1. (continued).

Receptor *	Functional Groups Represented	Assessment Endpoint No.	INEEL Specific Data **	GIS Spatial Analysis or Other Distribution Maps **	Comment	Retained as a Primary Receptor?
Pygmy rabbit	Mammalian herbivores (M122A)	3,5	Cottontail rabbit tissue concentrations for metals and radionuclides (See attachment 9, in Appendix D of DOE-ID 1999); radionuclide concentrations in cottontail rabbits (Janke and Arthur 1985); I-129 concentrations in thyroid tissue in rabbit species (Fraley et al. 1982) (Gablcr and Laundre in press)	Preliminary interpretive map for pygmy rabbit	Species of concern; used to also represent other rabbits and small ground dwelling or burrowing mammals	Yes
Nuttall's cottontail	Mammalian herbivores (M122A)	3,5,6	Cottontail rabbit tissue concentrations for metals and radionuclides (See attachment 9, in Appendix D of DOE-ID, 1999); radionuclide concentrations in cottontail rabbits (Janke and Arthur 1985); I-129 concentrations in rabbit species (Fraley et al. 1982)	None to date	Represented by the pygmy rabbit, which is a species of concern	No
Montane vole	Mammalian herbivore (M122A)	3,6	Not determined	None to date	Represented by the pygmy rabbit, which is a species of concern	No

Table H6-1. (continued).

Receptor *	Functional Groups Represented	Assessment Endpoint No.	INEEL Specific Data **	GIS Spatial Analysis or Other Distribution Maps **	Comment	Retained as a Primary Receptor?
Deer mouse	Mammalian omnivores (M422)	3,6	Deer mice tissue concentrations for metals and radionuclides (See attachment 9, in Appendix D of DOE-ID 1999); deer mice data for radionuclides (Arthur and Janke 1986); radionuclide concentrations in deer mice (Arthur et al. 1987) plutonium and americium concentrations in deer mice tissue (Markham et al. 1978); radionuclide concentrations in deer mice (Markham 1978); *I-129 concentrations in small mammals (Morris 1999?)*	None to date	Used to represent other small mammalian omnivores and insectivores (e.g., Merriam's shrew)	Yes
Merriam's shrew	Mammalian insectivores (M222)	3	Grasshopper and beetle tissue concentrations for metals and radionuclides (See attachment 9, in Appendix D of DOE-ID 1999); deer mice tissue concentrations for metals and radionuclides (See attachment 9, in Appendix D of DOE-ID 1999)	None to date	Represented by the deer mouse, which is an omnivore; therefore, insects as a dietary item are addressed.	No
Mule deer	Mammalian herbivores (M122)	3,5	Plant tissue concentrations for metals and radionuclides (See attachment 9, in Appendix D of DOE-ID 1999; I-129 concentrations in mule deer thyroid tissue (Markham et al. 1983) (Warren 1999)	Preliminary interpretive map for mule deer	Common; used to represent other large mammalian herbivores (e.g., pronghorn, elk).	Yes

Table H6-1. (continued).

Receptor *	Functional Groups Represented	Assessment Endpoint No.	INEEL Specific Data **	GIS Spatial Analysis or Other Distribution Maps **	Comment	Retained as a Primary Receptor?
Pronghorn	Mammalian herbivores (M122)	3,5	Plant tissue concentrations for metals and radionuclides (See attachment 9, in Appendix D of DOE-ID 1999); plutonium concentrations in pronghorn lung tissue (Markham et al. 1979); Sr-90 concentrations in pronghorn bone (Markham et al. 1980a); radionuclides in pronghorn tissues (Markham at al. 1982); ^{137}Cs data in pronghorn muscle and liver (Markham et al. 1985); (Warren 1999)	None to date	Represented by the mule deer, which is common on the INEEL; pronghorn is also a game species.	No
Elk	Mammalian herbivores (M122)	3,5	Plant tissue concentrations for metals and radionuclides (See attachment 9, in Appendix D of DOE-ID 1999); (Warren 1999)	Preliminary interpretive map for elk	Represented by the mule deer, which is common on the INEEL; elk is also a game species.	No
Coyote	Mammalian carnivores (M322)	3	Radionuclide concentrations in coyote feces (Arthur and Markham 1982); habitat use by coyote in areas of low vegetal heterogeneity (Laundré et al. 1991); coyote feeding strategies (MacCracken and Hansen 1987); ecology of bobcats (Knick 1987)	None to date	Common; also represents long-tailed weasel and other carnivores, including felids	Yes
Long-tailed weasel	Mammalian carnivores (M322)	3	Not determined	None to date	Represented by the coyote	No
Gray wolf	Mammalian carnivores (M322)	3	Not determined	None to date	T/E species; rare; represented by the coyote	No
Townsend's western big-eared bat	Mammalian insectivores (M210A)	3	Bat species overwintering in lava-tube caves (Wackenhut 1990)	None to date	Species of concern; includes other bats	Yes

Table H6-1. (continued).

Receptor *	Functional Groups Represented	Assessment Endpoint No.	INEEL Specific Data **	GIS Spatial Analysis or Other Distribution Maps **	Comment	Retained as a Primary Receptor?
Long-eared myotis	Mammalian insectivores (M210)	3	Bat species overwintering in lava-tube caves (Wackenhut 1990)	None to date	Represented by Townsend's western big-eared bat	No
Small-footed myotis	Mammalian insectivores (M210A)	3	Bat species overwintering in lava-tube caves (Wackenhut 1990)	None to date	Represented by Townsend's western big-eared bat	No
Loggerhead shrike	Avian carnivores (AV322)	3	Not determined	Preliminary interpretive map for the loggerhead shrike	Federal C2 candidate species; used to also represent other small carnivorous avian species	Yes
American kestrel	Avian carnivores (AV322)	3	Radionuclide concentrations in kestrel, long-eared owl and marsh hawk (Craig et al. 1979)	None to date	Represented by the ferruginous hawk	No
Ferruginous hawk	Avian carnivores (AV322)	3	Radionuclide concentrations in kestrel, long-eared owl and marsh hawk (Craig et al. 1979)	Preliminary interpretive map for the ferruginous hawk	Federal C2 candidate species; used to also represent the American kestrel, other hawks, eagles, and other small- to medium-size raptors	Yes
Burrowing owl	Avian carnivores (AV322A)	3	Activity patterns and home-range used of nesting long-eared owls (Craig et al. 1988); radionuclide concentrations in kestrel, long-eared owl and marsh hawk (Craig et al. 1979)	Preliminary interpretive map for the burrowing owl	Species of concern; used also to represent other owls	Yes

Table H6-1. (continued).

Receptor *	Functional Groups Represented	Assessment Endpoint No.	INEEL Specific Data **	GIS Spatial Analysis or Other Distribution Maps **	Comment	Retained as a Primary Receptor?
Mourning dove	Avian herbivores (AV122)	3,5	^{137}Cs data in mourning dove muscle (Arthur and Janke 1986); radionuclide concentrations in sage grouse (Connelly and Markham 1983); radionuclide concentrations in mourning dove tissues (Markham and Halford 1982); ^{137}Cs data in mourning dove muscle (Markham et al 1985); BBS data; mourning dove use of man-made ponds (Howe and Flake 1989); nesting ecology of mourning doves (Howe and Flake 1989); mourning dove movement during the reproductive season (Howe and Flake 1988); *ESRF Warren & Morris data*	None to date	Common; used also to represent other herbivorous passerine birds, (e.g., horned lark); receptor is also a game species	Yes
Horned lark	Avian herbivores (AV122)	3,6	BBS data	None to date	Represented by the mourning dove	No
Sage grouse	Avian herbivore (AV122)	3,5	Seasonal movements of sage grouse (Connelly et al. 1988); BBS data	None to date	Represented by the mourning dove, which is also a game species	No
Blue-winged teal	Avian (aquatic) herbivores (AV143)	4,5	Radionuclide concentrations in waterfowl (Halford et al. 1981, 1982a); radionuclide concentrations in ducks (Markham et al. 1988*);*BBS data*; other concentrations of waterfowl using ponds*	None to date	Not common on the INEEL	Yes

Table H6-1. (continued).

Receptor *	Functional Groups Represented	Assessment Endpoint No.	INEEL Specific Data **	GIS Spatial Analysis or Other Distribution Maps **	Comment	Retained as a Primary Receptor?
White-faced ibis	Avian (aquatic) insectivore (AV233)	4	BBS data	None to date	C2 Federal candidate species; represented by the blue-winged teal, a game species; although receptor is an insectivore, aquatic habitat is very limited and this species is rare	No
American coot	Avian (aquatic) omnivore (AV442)	4,5	BBS data	None to date	Represented by the blue-winged teal, a game species; although receptor is an omnivore, aquatic habitat is very limited and the American coot is uncommon on the INEEL	No
Black tern	Avian (aquatic) insectivore (AV210)	3	BBS data	None to date	Federally-listed C2 candidate species; although this species is a shorebird, it is represented by the blue-winged teal; although receptor is an insectivore, aquatic habitat is very limited and the black tern is rare on the INEEL	No
Sage sparrow	Avian insectivores (AV222)	3	BBS data; territory dynamics in a sage sparrow population (Petersen and Best, 1987)	None to date	Common; also used to represent other terrestrial avian insectivores	Yes
Red-winged blackbird	Avian insectivores (AV232)	3	BBS data	None to date	Represented by the sage sparrow; aquatic habitat is limited	No

Table H6-1. (continued).

Receptor *	Functional Groups Represented	Assessment Endpoint No.	INEEL Specific Data **	GIS Spatial Analysis or Other Distribution Maps **	Comment	Retained as a Primary Receptor?
Barn swallow	Avian insectivore (AV210)	3	Barn swallow tissue concentrations for radionuclides (Millard et al. 1990); BBS data; *ESRF data from Warren & Morris*	None to date	Represented by the sage sparrow	No
Black-billed magpie	Avian omnivores (AV422)	3	BBS data	None to date	Also used to represent crows, ravens, and other avian omnivores	Yes

*Receptors in bold selected for quantitative (where possible) and qualitative risk estimates.

**Text in italics indicates studies which have been tentatively identified for applicability to the OU 10-04 ERA.

Table H6-2. Summary of Assessment Endpoints, Receptors, and Measures.

Assessment Endpoint	Receptor	Measures of Exposure	Measures of Effects	Measures of Receptor and Ecosystem Characteristics/Additional Lines of Evidence
1.	Plants	COPC concentrations in soil and plant tissues.	HQ and HIs for COPCs in direct contact with plants; qualitative discussion for COPCs lacking toxicity data; qualitative and quantitative vegetation surveys and transects	Biomass, diversity, and percent cover information, and long-term vegetation mapping are also available
2.	Beetles, grasshoppers	COPC concentrations in soil	HQ and HIs for COPCs in direct contact with soil fauna; qualitative discussion for COPCs lacking toxicity data	Compilation of INEEL soil types
3.	All terrestrial receptors as listed below:	COPC concentrations in soil, surface water, sediment, plant and small mammal tissue; modeled COPC concentrations in upper trophic level receptors as appropriate	HQ and HIs for COPCs for soil, surface water, and dietary ingestion HQs and HIs for COPC exposure via inhalation of fugitive dust and dermal exposure Qualitative discussion for COPCs lacking toxicity data Qualitative discussion for receptors lacking exposure parameters	T/E surveys INEEL topography Abundance and distribution of suitable forage areas Abundance and distribution of suitable nesting or breeding locations and areas Abundance and distribution of prey species Abundance and distribution of suitable habitat
	Mule deer	"" ""	As above for mule deer	As in 3, above, including Idaho Fish & Game (ID F&G) game tag data
	Pygmy rabbit	"" ""	As above for pygmy rabbit	As in 3 , above including ESRF rabbit survey data from 1980 to 1999, which provides relative abundance information
	Deer mouse	"" ""	As above for deer mouse	As in 3, above
	Coyote	"" ""	As above for coyote	As in 3, above
	Townsend's western big-eared bat	"" ""	As above for Townsend's western big-eared bat	As in 3, above

Table H6-2. (continued).

Assessment Endpoint	Receptor	Measures of Exposure	Measures of Effects	Measures of Receptor and Ecosystem Characteristics/Additional Lines of Evidence
3., continued	Mourning dove	"" ""	As above for mourning dove	As in 3, above including Environmental Science and Research Foundation (ESRF) Breeding Bird Survey (BBS) data; BBS includes changes over multiple years, species richness and data pertinent to distribution and populations
	Sage sparrow	"" ""	As above for sage sparrow	As in 3, above including ESRF BBS data
	Ferruginous hawk	"" ""	As above for ferruginous hawk	As in 3, above including ESRF BBS data
	Loggerhead shrike	"" ""	As above for loggerhead shrike	As in 3, above including ESRF BBS data
	Burrowing owl	COPC concentrations in soil, surface water, sediment, plant and small mammal tissue; modeled COPC concentrations in upper trophic level receptors as appropriate	As above for burrowing owl	As in 3, above including ESRF BBS data
	Black-billed magpie	"" ""	As above for black-billed magpie	As in 3, above, including ESRF BBS data
	Great Basin spadefoot toad	COPC concentrations in soil, surface water and sediment	Qualitative evaluation	As in 3, above
	Sagebrush lizard	COPC concentrations in soil	HQs and HIs (if possible) as above for sagebrush lizard depending on availability of TRVs and exposure parameters	As in 3, above

Table H6-2. (continued).

Assessment Endpoint	Receptor	Measures of Exposure	Measures of Effects	Measures of Receptor and Ecosystem Characteristics/Additional Lines of Evidence
4.	Blue-winged teal	COPC concentrations in surface water and sediment	HQs and HIs for blue-winged teal for sediment, surface water, and dietary ingestion depending on availability of dietary items for evaluation	As in 3, above, including ESRF BBS data
			HQs and HIs for COPC exposure via dermal exposure to organic compounds	
			Qualitative discussion for COPCs lacking toxicity data	
			Qualitative discussion for receptors lacking exposure parameters	
5.	Various receptors as shown below:	COPC concentrations in soil, surface water, sediment, and plant tissue; modeled COPC concentrations in upper trophic level receptors as appropriate	HQ and HIs for COPCs for soil, surface water, and dietary ingestion	As in 3, above, including ID F&G game tag data.
			HQs and HIs for COPC exposure via inhalation of fugitive dust and dermal exposure	
			Qualitative discussion for COPCs lacking toxicity data	
			Qualitative discussion for receptors lacking exposure parameters	
	Mule deer	"" ""	HQs and HIs as in 5., above for mule deer	As in 3, above, including ID F&G game tag data.
	Blue-winged teal — waterfowl, shorebirds	COPC concentrations in surface water and sediment	HQs and HIs as in 5., above for blue-winged teal	As in 3, above, including ID F&G game tag data.
	Mourning dove	COPC concentrations in soil, surface water and plant tissue; modeled COPC concentrations in upper trophic level receptors	HQs and HIs as in 5., above for mourning dove	As in 3, above, including ID F&G game tag data.

Table H6-2. (continued).

Assessment Endpoint	Receptor	Measures of Exposure	Measures of Effects	Measures of Receptor and Ecosystem Characteristics/Additional Lines of Evidence
5., continued	Pygmy rabbit	COPC concentrations in soil, surface water and plant tissue; modeled COPC concentrations in upper trophic level receptors	HQs and HIs as in 5., above for pygmy rabbit	As in 3, above, including ID F&G game tag data, and ESRF rabbit counts
6.	Nuttall's cottontail, montane volc, horned lark, beetles, grasshoppers	COPC concentrations in soil, surface water, beetles, grasshoppers, and plant tissue; modeled COPC concentrations in upper trophic level receptors	HQs and HIs as in 5., above for listed receptors	T/E surveys, BBS INEEL topography Abundance and distribution of suitable forage areas and prey species Abundance and distribution of suitable nesting or breeding locations and areas Abundance and distribution of suitable habitat

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Attachment 1

INEEL Ecological Resources at Risk

ATTACHMENT 1

A1-1. INEEL ERALOGICAL RESOURCES AND VALUES AT RISK

A summary of INEEL-wide ecological resources as they relate to management goals and which require consideration in the OU 10-04 ERA is given in Table 1. The summary was compiled using the natural resource valuation methodology presented in Wyant et al. (1996; 1995) to identify and categorize INEEL natural resources in terms of their current potential economic and social values. Defining and managing INEEL natural resources in terms of ecosystem values, goods and benefits appears to be a viable concept for incorporating differing trustee interests and expectations. It is important, therefore, to define the products or benefits related to specific ecological resources (individual or groups of species, communities or other resource attributes) which, if adversely impacted through contaminant exposure, could affect the product or benefit in question.

The values, goods and benefits presented on Table 1 can be generally divided into three resource categories: (1) terrestrial and aquatic ecological, (3) landscape, and (4) cultural/societal. A combination of the processes described herein in has been used to provide information to characterize the resources in each of these four categories that may be impacted within the INEEL assessment areas. Individual entities associated with each resource category are described in the following sections.

A1-1.1 Vegetation and Soil Resources

INEEL vegetation and soil resources potentially impacted by exposure to contaminants are summarized on Table 2. These resources are discussed in more detail in the following sections. Quantitative risk estimates were developed for only a few contaminants based on availability of toxicity data. The exposure analysis was limited to plants and soil fauna in direct contact with surface soil.

A1-1.1.1 Plant Species of Special Interest

A number of plant species found on the INEEL are of particular interest from either a regulatory or ecological standpoint:

- Lemhi milkvetch—State of Idaho, BLM and USFS sensitive species
- Plains milkvetch—State of Idaho-Priority 1, BLM and USFS sensitive species
- Wing-seed evening primrose—State of Idaho, and BLM sensitive species
- Spreading gilia—State of Idaho-Priority 2, and BLM sensitive species
- King's bladderpod—State of Idaho monitor species
- Ute's ladies tresses—Federally-listed threatened species

Although risk to plants in general is shown by the WAG ERAs, GIS analyses, and rare plant surveys (Morris 1998) indicate that sensitive species are unlikely to occur inside the assessment areas (excluding the ordnance areas). Quantitative risk estimates will not be calculated for rare plants per se. Risks to INEEL vegetation will be used to address risks to rare plant species and qualitative discussion will also be provided.

Table A1-1. Summary of INEEL ecosystem values, goods, and benefits (after Wyant et al. 1996).*

INEEL Assets	Values, Goods, and Benefits *	INEEL Resources
INEEL Ecosystem Values	Landscape diversity Species diversity Genetic diversity	INEEL plant communities (all species) INEEL sensitive plant species INEEL wildlife communities (all species) INEEL T/E and sensitive wildlife species INEEL soil communities
	Wildlife/endangered species food and habitat	INEEL native plant communities and prey base
	Pollination	INEEL pollinating insect species and populations
	Migratory Corridor	Pronghorn populations Elk populations Deer populations Waterfowl populations Sage grouse populations Migratory bird populations—songbirds, raptors
	Surface water	Big Lost River, Birch Creek Drainage, Big Lost River sinks wetland habitat
	Soil productivity and stability	Plant, insect and soil communities
	Live animals	INEEL wildlife (all species)
	Live plants	INEEL vegetation (all species)
	Unique and special habitats	Big Lost River drainage, bat and snake hibernacula, INEEL migratory bird habitat, foothills of Beaverhead and Lemhi mountains
INEEL Ecosystem Goods	Human food	Pronghorn Elk Deer Rabbits Waterfowl Mourning dove Sage grouse Cattle Sheep Native plants used for traditional food and medicine
	Furbearers	Bobcat, coyote, rabbit
	Livestock forage	INEEL plant communities: native and seeded grasses and forbs, soil productivity
	Surface water (quality/quantity, aquifer recharge)	Snake River, Big Lost River, and Birch Creek aquifers
INEEL Ecosystem Benefits	Recreation—Hunting	Pronghorn populations Elk populations Deer populations Waterfowl populations Sage grouse and mourning dove populations
	Scientific Research	INEEL native wildlife and plant communities, large scale outdoor research sites; National Environmental Research Park (NERP)
	Heritage Value (cultural and religious, historical, uniqueness)	Native American religious sites, (caves, archaeological sites); Goodales Cutoff, EBR-I; NERP, National Important Bird Area
	Aesthetic Value	Scenery

* The term "services " was replaced with "benefits reflecting a more current philosophical approach towards ecology.

Table A1-2. INEEL vegetation and soil resources qualitatively and quantitatively evaluated in the OU 10-04 ERA.

Vegetation and Soil Resources	Evaluate in OU 10-04
Plant species of special interest	Yes (if present in potentially-impacted area)
Native plant communities	Yes
Native plants with traditional food and medicinal value	Yes
Plant productivity and forage value	Yes
Soil productivity, community structure and stability	Yes
Scientific and cultural significance	Qualitative

A1-1.1.2 Native Plant Communities (Diversity, Structure and Habitat Value)

A comprehensive list of plant species recorded on the INEEL is included in Anderson et al. (1996). A flora of 409 species has been compiled by ongoing surveys (J. Glennon, K. Holte), including 403 native species. Vegetation on the INEEL has also been mapped with cover classes of vegetation having been identified using satellite image analysis (Kramer et. al. 1992). The vegetation map, including cover class composition, can be found in Anderson et al., 1996. These classes will be used to identify vegetation resources in contaminant assessment areas addressed by OU 10-04 ERA.

A1-1.1.3 Plant Productivity and Forage Production

A1-1.1.3.1 Wildlife Forage. All portions of growing plants are used directly as food by herbivores and are, therefore, of major importance to all primary consumers represented in the food web.

Native grasses (both vegetative and seed) are widely used by INEEL wildlife species and comprise a significant portion of the diets of the cottontail, jackrabbit, Townsend's ground squirrel, and numerous other species. Nearly 60 grass or grass-like species (graminoids) are found on the INEEL, 44 of which are native (Anderson et al. 1996). Forb species are also a significant component of INEEL plant communities. Over 350 forb species (301 of which are native) (Anderson et al. 1996) are found on the INEEL and comprise an important component of herbivorous diets, especially in spring and early summer. Over 40 (44) native shrub species are found on the INEEL (Anderson et al. 1996). Species wholly or partially dependent on sagebrush as a food source include pronghorn, mule deer, pygmy rabbit, sage grouse, jackrabbits, and others.

A1-1.1.3.2 Livestock Forage. Livestock grazing occurs on much of the INEEL. Although potential contaminant transfer to humans through livestock is not addressed by the OU 10-04 ERA, potential damage to plants themselves due to exposure to contaminants is included. Forage consumed by sheep and cattle on the INEEL consists of native grasses and forbs (and to a lesser extent, shrubs); thus, livestock forage capacity constitutes an ecological resource with ecological receptors (plants).

Ordnance areas included under WAG 10 cover substantial areas within those grazing allotments. Concentrations of TNT and RDX at ordnance sites are at levels that have risk to plant receptors for some sites. Impacts to highly preferred forage species, loss of forage through reduced production, or the necessity to move to another location as a result of implementation of remedial alternatives should be considered. Ideally any remedial action should consider current and future use; therefore, maintenance of livestock forage (native, as well as seeded plants) should be considered.

A1-1.1.4 Soil Productivity, Community Structure, and Stability

Contaminant exposures in plant communities can have direct (plant death) and indirect (plant community alteration) effects on soil community productivity, structure and stability. Widespread deleterious effects to soil fauna communities will result in severe losses to upper trophic level receptors. In desert environments, special consideration is given to cryptogamic crusts, which help to prevent soil erosion and plant loss. Where toxicity data are available for soil fauna, quantitative risk estimates were addressed for the direct contact with soil exposure pathway. Qualitative information are also important in supporting potential remedial alternatives.

A1-1.1.5 Scientific and Cultural Significance

Numerous plants found at the INEEL have importance to cultural tradition (Anderson et al. 1996). Onion plant analytical data collected in May 1999 were evaluated quantitatively and qualitatively in the OU 10-04 ERA and their importance as a Native American resource was discussed.

A1-1.2 Wildlife Resources

Wildlife resources, evaluated quantitatively and/or qualitatively, are listed in Table 3. Where appropriate, INEEL-specific and other ARARs may apply. These include, but are not limited to, the Endangered Species Act, the Migratory Bird Act, and the Bald and Golden Eagle Protection Act.

A1-1.2.1 Threatened and Endangered (T/E) and Species of Concern

A list of (1) threatened or endangered (T/E) and (2) sensitive species potentially present at the INEEL was compiled from the U.S. Fish and Wildlife Service (USFWS 1997), the Idaho Department of Fish and Game Conservation Data Center for T/E and sensitive species for the State of Idaho (CDC 1994), and Radiological and Environmental Sciences Laboratory (RESL) documentation for the INEEL (Reynolds 1994; Reynolds et al. 1986). Threatened or endangered and sensitive species that may be found on the INEEL are listed in Table 4. The listing but addresses former C2 species as species of concern USFWS no longer maintains a candidate species (C2) (USFWS 1996). The C2 designation is retained here to maintain consistency with INEEL ERA assessments conducted before the USFWS change in listing procedures.

When the screening-level ecological risk assessments (SLERAs) were performed for some of the INEEL WAGs, oxytheca (*Oxytheca dendroidea*) was listed as a sensitive species with the BLM and the Idaho Native Plant Society (INPS)/Idaho Fish and Game Conservation Data Center. However, it has since been found to be more abundant than formerly believed and has been removed from the BLM and INPS lists (INPS 1996). An INPS monitor species, painted milkvetch (*Astragalus ceramicus* var. *apus*), also was recently removed from the federal list of species being considered for T/E listing (CDC 1994).

The occurrence of the gray wolf on the INEEL is unverified. However, because of anecdotal evidence (Morris 1998) and that the wolf is federally listed, this species is listed.

Where appropriate, biosurvey results that evaluated the available habitat for selected species of concern will be incorporated quatitatively in the lines of evidence (Morris et al 1999). The methodology for performing these surveys is presented in Appendix D of the OU 10-04 Work Plan (DOE-ID 1999).

A1-1.2.2 Terrestrial Wildlife Community Structure

Wildlife in all functional groups has been shown in the preliminary analyses to be at risk. All groups were included as appropriate in the OU 10-04 assessment.

A1-1.2.3 Aquatic Wildlife Community Structure

Aquatic herbivores and insectivores were evaluated both qualitatively and quantitatively, as appropriate, based on the availability of toxicity data, exposure parameters, analytical data, and uptake factors. The blue-winged teal is used to represent all aquatic avian species, including the black tern, an insectivorous shorebird, since the aquatic resources associated with the OU 10-04 sites are limited. No other aquatic species were addressed quantitatively in the ERA.

A1-1.2.4 Wildlife and Insect Prey Base

All major prey species are covered by groups/individuals within the terrestrial wildlife category. Terrestrial invertebrates should be addressed qualitatively and quantitatively where possible as described in Table 2 of this white paper, "Selection of Management Goals, Endpoints, Measures, and Receptors." However, this is limited due to the lack of data available.

A1-1.2.5 Game Species and Furbearing Populations

Preliminary analyses indicated that elk and waterfowl might be eliminated from the OU 10-04 ERA; however, as a conservative measure, both receptor groups were addressed both quantitatively and qualitatively, as applicable, in the site-wide ERA. Potential exposures for furbearers are covered under mammalian carnivores. The GIS overlay for elk (white paper entitled "GIS Data Compilation, Mapping, and Analyses") is based on telemetry data for several radio-collared individuals collected over an approximate 10-year span. The data sets indicate that the radio-collared animals roamed east to the INEEL boundary, no further west than the central portion of the INEEL, and no further north than the midsection of the INEEL. This behavior may be interpreted as a restriction to their home range.

A1-1.2.6 Pollinating Insects and Wildlife

Pollinating insects will be quantitatively and qualitatively addressed as terrestrial invertebrates in the OU 10-04 ERA as mentioned in Section 1.4 and 2.4, above. All avian species are covered under wildlife in general as presented in Section 2.

A1-1.2.7 Migratory Birds

Over 80% of the avian species on the INEEL could be considered migratory species. As such, their populations are protected under special provisions of the Migratory Bird Treaty Act. The Migratory Bird and Wild Bird Conservation Acts represent other Federal and domestic laws protecting avian habitats and populations. All avian species were assessed in the WAG ERA under their functional groups. It is assumed that selecting a primary receptor to represent one or more functional groups will be protective of the species under those functional groups (Section 2.2).

Table A1-3. INEEL wildlife resources to be evaluated in the OU 10-04 ERA.

Wildlife Resources	Evaluate in OU 10-04
T/E and species of concern:	
Pygmy rabbit	Yes
Townsend's big-eared bat	Yes
Long-eared myotis	Yes—qualitatively as receptor relates to the Townsend's western big-eared bat
Small-footed myotis	Yes—qualitatively as receptor relates to the Townsend's western big-eared bat
Merriam's shrew	Yes—qualitatively as receptor relates to the Townsend's western big-eared bat
Black tern	Yes–qualitatively as receptor relates to the blue-winged teal
Peregrine falcon	Yes–qualitatively as receptor relates to the ferruginous hawk
Northern goshawk	Yes–qualitatively as receptor relates to the ferruginous hawk
Bald eagle	Yes–qualitatively as receptor relates to the ferruginous hawk
Ferruginous hawk	Yes
Loggerhead shrike	Yes
Burrowing owl	Yes
Gray wolf	Yes–qualitatively
Sagebrush lizard	Yes–qualitatively
Terrestrial wildlife community structure:	
Avian herbivores	Yes
Avian insectivores	Yes
Avian omnivores	Yes
Avian carnivores	Yes
Mammalian herbivores	Yes
Mammalian insectivores	Yes
Mammalian omnivores	Yes
Mammalian carnivores	Yes
Amphibians and reptiles	Yes—Great Basin spadefoot toad, gopher snake, sagebrush lizard (qualitatively)
INEEL aquatic wildlife community structure	Yes
Aquatic herbivores – Blue-winged teal	Yes
INEEL wildlife and insect prey base	Yes
INEEL Game species and furbearing populations:	
Elk	Yes–as represented by the mule deer
Mule deer	Yes
Pronghorn	Yes–as represented by the mule deer
Waterfowl	Yes–as above under aquatic community structure
Sage grouse	Yes–as represented by the mourning dove
Mourning dove	Yes
Rabbits	Yes–as represented by the pygmy rabbit
Coyote	Yes
Bobcat	Yes–qualitatively as receptor relates to the coyote
Pollinating insect and wildlife species	Yes–qualitatively and quantitatively as receptors relate to grasshoppers and beetles
Migratory bird populations	Yes

Table A1-4. Threatened or endangered species, sensitive species, and species of concern that may be found on the INEEL.[a]

Common Name	Scientific Name	Federal Status[b,c]	State Status[c]	BLM Status[c]	USFS[f] Status[c]
Plants					
Lemhi milkvetch	*Astragalus aquilonius*	—	S	S	S
Painted milkvetch[e]	*Astragalus ceramicus var. apus*	3c	R	—	—
Plains milkvetch	*Astragalus gilviflorus*	NL	1	S	S
Winged-seed evening primrose	*Camissonia pterosperma*	NL	S	S	—
Nipple cactus[e]	*Coryphantha missouriensis*	NL	R	—	—
Spreading gilia	*Ipomopsis (=Gilia) polycladon*	NL	2	S	—
King's bladderpod	*Lesquerella kingii var. cobrensis*	—	M	—	—
Tree-like oxytheca[e]	*Oxytheca dendroidea*	NL	R	R	—
Inconspicuous phacelia[d]	*Phacelia inconspicua*	C2	SSC	S	S
Ute ladies' tresses[d]	*Spiranthes diluvialis*	LT	—	—	—
Puzzling halimolobos	*Halimolobos perplexa var. perplexa*	—	M	—	S
Birds					
Peregrine falcon	***Falco peregrinus***	3c	E	—	—
Merlin	*Falco columbarius*	NL	—	S	—
Gyrfalcon	*Falco rusticolus*	NL	SSC	S	—
Bald eagle	***Haliaeetus leucocephalus***	LT	T	—	—
Ferruginous hawk	***Buteo regalis***	C2	SSC	S	—
Black tern	*Chlidonias niger*	C2	—	—	—
Northern pygmy owl[d]	*Glaucidium gnoma*	—	SSC	—	—
Burrowing owl	***Athene cunicularia***	C2	—	S	—
Common loon	*Gavia immer*	—	SSC	—	—
American white pelican	*Pelicanus erythrorhynchos*	—	SSC	—	—
Great egret	*Casmerodius albus*	—	SSC	—	—
White-faced ibis	*Plegadis chihi*	C2	—	—	—
Long-billed curlew	*Numenius americanus*	3c	—	S	—
Loggerhead shrike	***Lanius ludovicianus***	C2	NL	S	—
Northern goshawk	***Accipiter gentilis***	C2	S	—	S
Swainson's hawk	*Buteo swainsoni*	—	—	S	—
Trumpeter swan	*Cygnus buccinator*	C2	SSC	S	S
Sharptailed grouse	*Tympanuchus phasianellus*	C2	—	S	S
Boreal owl	*Aegolius funereus*	—	SSC	S	S
Flammulated owl	*Otus flammeolus*	—	SSC	—	S
Mammals					
Gray wolf[g]	***Canis lupus***	LE/XN	E	—	—
Pygmy rabbit	***Brachylagus (=Sylvilagus) idahoensis***	C2	SSC	S	—
Townsend's Western big-eared bat	***Corynorhinus (=Plecotus) townsendii***	C2	SSC	S	S
Merriam's shrew	*Sorex merriami*	—	S	—	—
Long-eared myotis	***Myotis evotis***	C2	—	—	—

Table A1-4. (continued).

Common Name	Scientific Name	Federal Status[b,c]	State Status[c]	BLM Status[c]	USFS[f] Status[c]
Small-footed myotis	***Myotis ciliolabrum (=subulatus)***	C2	—	—	—
Western pipistrelle[d]	*Pipistrellus hesperus*	NL	SSC	—	—
Fringed myotis[d]	*Myotis thysanodes*	—	SSC	—	—
California myotis[d]	*Myotis californicus*	—	SSC	—	—
Reptiles and amphibians					
Northern sagebrush lizard	***Sceloporus graciosus***	C2	—	—	—
Ringneck snake[d]	*Diadophis punctatus*	C2	SSC	S	—
Night snake[e]	*Hypsiglena torquata*	—	—	R	—
Insects					
Idaho pointheaded grasshopper[d]	*Acrolophitus punchellus*	C2	SSC	—	—
Fish					
Shorthead sculpin[d]	*Cottus confusus*	—	SSC	—	—

a. This list was compiled from a letter from the U.S. Fish and Wildlife Service (USFWS) (1997) for threatened or endangered, and sensitive species listed by the Idaho Department of Fish and Game (IDFG) Conservation Data Center (CDC 1994 and IDFG web site 1997) and Radiological Environmental Sciences Laboratory documentation for the INEEL (Reynolds et al. 1986).
b. The USFWS no longer maintains a candidate (C2) species listing but addresses former listed species as "species of concern" (USFWS 1996). The C2 designation is retained here to maintain consistency between completed and ongoing INEEL ERA assessments.
c. Status codes: INPS=Idaho Native Plant Society; S=sensitive; 2=State Priority 2 (INPS); 3c=no longer considered for listing; M=State of Idaho monitor species (INPS); NL=not listed; 1=State Priority 1 (INPS); LE=listed endangered; E=endangered; T = threatened; XN = experimental population, nonessential; SSC=species of special concern; and C2 = see item b, formerly Category 2 (defined in CDC 1994). BLM=Bureau of Land Management; R = removed from sensitive list (nonagency code added here for clarification).
d. No documented sightings at the INEEL; however, the ranges of these species overlap the INEEL and are included as possibilities to be considered for field surveys.
e. Recent updates that resulted from Idaho State Sensitive Species meetings (BLM, USFWS, INPS, and USFS) - (INPS 1995, 1996, and 1997).
f. U.S. Forest Service (USFS) Region 4.
g. Anecdotal evidence indicates that isolated wolves may occur on the INEEL. However, no information exists to substantiate hunting or breeding on site (Morris 1998).

A1-1.3 Landscape Resources

Landscape resources that may be impacted as a result of contamination are given on Table 5. Indirect impacts to landscape resources may result from contaminant-induced changes to plant communities, soil and topography (e.g., by wind erosion).

A1-1.3.1 Wetlands (Including Big Lost River and Birch Creek Drainages)

General resource values associated with surface water features include water quality, aquifer recharge, and habitat for wildlife (e.g., Great Basin spadefoot toad, aquatic species, and shorebirds). As part of the National Wetland Inventory (NWI), the U.S. Fish and Wildlife Service (USFWS) has mapped wetland habitat on the INEEL.

Areas on the INEEL identified in the NWI include numerous playas, basins, and the Big Lost River and Birch Creek drainages (Hampton et al. 1995). A number of manmade ponds, including facility impoundments, also appear on the maps. The NWI program was implemented to characterize and map United States wetland resources using the FWS wetlands classification system (Cowardin et al. 1979). The maps are primarily based on hydrological (and to some extent, vegetative) features mapped from high altitude aerial photographs (USFWS 1990) and verified by limited ground truthing. The primary purpose of the maps is to identify wetland habitat. The maps are not intended to represent jurisdictional wetland boundaries. Wetlands subject to agency regulation must meet rigorous vegetation, hydrological and soil criteria verified through a formalized field survey and delineation process (USACOE 1987;

FICWD 1989). Some areas within the Big Lost River drainage, the "sinks" for example, have characteristics that meet these criteria. However, the precise locations and extent of the areas have not been delineated for regulatory purposes. The surface water and wildlife associated with the Big Lost River drainage are generally outside primary areas of contaminant assessment. Impacts as a result of contaminant exposures are unlikely, and were not assessed quantitatively (or addressed by other vegetation/wildlife exposure scenarios).

Back in the early 1990s, water was diverted from the Birch Creek drainage west of the INEEL to supply a private hydro-electrical generation plant north of the INEEL. Some flow is eventually returned to the INEEL via a modified canal and gravel pit catch basin north and east of the original streambed. No flow is released to the original streambed past the diversion except during spring runoff. As a result of this diversion, former riparian communities along the natural drainage have largely disappeared. However, some larger trees (primarily water birch (*Betula occidentalis*)), which have historically provided communal roosts for wintering long-eared owls, are still maintained in some areas through groundwater flow in below-grade gravel strata. However, the surface water and wildlife associated with the Birch Creek drainage are generally outside primary areas of contaminant assessment. As a result, impacts as a result of contaminant exposures are unlikely, and were not addressed quantitatively (or addressed by other vegetation/wildlife exposure scenarios).

A1-1.3.2 Caves

Lava tube caves on the INEEL provide unique habitat for flora and fauna, especially bats and owls. The Townsend's big-eared bat, one of the two Federally-listed Category 2 species found on the INEEL, is one of several species that use the caves for roosting, reproduction, and hibernation. The unique aspects of caves are afforded specific protection under the Federal Cave Resources Management Plan. INEEL caves also carry religious significance to local Native American tribes (i.e., Shoshone-Bannock). Cave habitats could become contaminated through deposition of feces by bats and owls feeding on contaminated prey. However, surveys conducted by ESRF scientists have shown no evidence to indicate that contamination to caves has occurred. Caves (as habitat resources) are unlikely to be themselves at risk since most are out of the areas in which direct contamination might occur (or has occurred in the past). Therefore, caves were not directly assessed in the OU 10-04 ERA. Potential contaminant exposures for wildlife associated with cave habitat resources (primarily bats and owls) are addressed under wildlife resources (Section 2).

A1-1.3.3 Manmade Structures

Manmade structures including buildings, fences and power lines provide roosting, nesting, and escape cover for raptors, reptiles, and small mammals and lighting draws bats. Although such structures were not assessed in the ERA, their presence or absence may be important in terms of remediation, especially for bat species.

Table 5. INEEL landscape resources to be evaluated in the OU 10-04 ERA.

Landscape Resources	Evaluate in OU 10-04
Wetlands	Qualitative
Caves	No
Manmade structures	No
Migratory corridor	Qualitative

A1-1.3.4 Migratory Corridor

Pronghorn, elk, raptors and other avian and mammal species have benefited from the isolation and relatively large tracts of undisturbed habitat provided by the INEEL. These species use the INEEL on a seasonal basis as a pathway from offsite areas. Significant tracts of unbroken habitat, including their cover and forage values, are important resources and should be considered in any remediation plans. Migratory corridors were discussed qualitatively, as possible and appropriate, within the context of the OU 10-04 ERA.

A1-1.4 Cultural and societal resources

Native plants that have cultural significance will be assessed through plants in general as identified in Section H6. Physical sites (e.g. archaeological) are not addressed in terms of ecological risk; however, their presence requires consideration and possible protection in terms of remediation. The National Environmental Research Park (NERP) and National Important Bird Area likewise require careful consideration during remediation planning.

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Attachment 2

OU 10-04 Fauna and Functional Groups

Table A2-1. Faunal functional groups and species potentially present at the INEEL.

Class	Functional Group	Taxonomic Name	Common Name	Distribution/ Status[a]	Abundance/ Season/status[b]
Aves	AV121	*Carduelis pinus*	Pine siskin	f, d	S5, M3
		Carduelis tristis	American goldfinch	d, ss	M5
		Coccothraustes vespertinus	Evening grosbeak	d	S5, M3
		Bombycilla cedrorum	Cedar waxwing	f, d	S5,M3,W5
Aves	AV122	*Passer domesticus*	House sparrow	f, d	B2, M1, W3
		Selasphorus rufus	Rufous hummingbird	d	S3, M3
		Zenaida macroura	Mourning dove	sw	B1, M3, W5
		Chondestes grammacus	Lark sparrow	sw	S3, M5
		Plectrophenax nivalis	Snow bunting	g, ss	W5
		Leucosticte arctoa	Rosy finch	ss	M5, W5
		Carpodacus mexicanus	House finch	f, d	S3, M3
		Perdix perdix	Gray partridge	g, ss, f	R3
		Alectoris chukar	Chukar	g, ss	R3
		Dendragapus obscurus	Blue grouse	f	S6
		Centrocercus urophasianus	Sage grouse	ss, g, f	R2
		Eremophila alpestris	Horned lark	g, ss	R2
		Junco hyemalis	Dark-eyed junco	sw	M3
		Columba livia	Rock dove	sw	R2
Aves	AV132	*Porzana carolina*	Sora	w, f	B5, M5
Aves	AV210	*Contopus borealis*	Olive-sided flycatcher	d	S5, M5
		Chlidonias niger	Black tern	w	S5, M5
		Empidonax difficilis	Western flycatcher	d	S5
		Myiarchus cinerascens	Ash-throated flycatcher	d	S5
		Tyrannus verticalis	Western kingbird	f, d, j	B3, M3
		Tyrannus tyrannus	Eastern kingbird	f, d, j	B3, M3
		Tachycineta bicolor	Tree swallow	d, j	B3, M3
		Tachycineta thalassina	Violet-green swallow	d, j	B4, M4
		Myadestes townsendi	Townsend's Solitaire	d	S5, M5
		Chordeiles minor	Common nighthawk	sw	B2, M3
		Aeronautes saxatalis	White-throated swift	d	S5
		Sayornis saya	Say's phoebe	ss, d, f, j	B3, M3
Aves	AV210A	*Stelgidopteryx serripennis*	Northern rough-winged swallow	d, j	B3, M3
		Riparia riparia	Bank swallow	d, j	B5, M3

Table A2-1. (continued).

Class	Functional Group	Taxonomic Name	Common Name	Distribution/ Status[a]	Abundance/ Season/status[b]
		Hirundo pyrrhonota	Cliff swallow	d, j	B2, M2
		Hirundo rustica	Barn swallow	d, j	B2, M3
Aves	AV221	*Regulus calendula*	Ruby-crowned kinglet	d	M3, W6
		Sialia mexicana	Western bluebird	ss	S5, M5
		Bombycilla garrulus	Bohemian waxwing	f, d	S3, M2, W3
		Vireo gilvus	Warbling vireo	d	S5, M5
		Dendroica petechia	Yellow warbler	d	B5, M3
		Dendroica coronata	Yellow-rumped warbler	d	S3, M3
		Dendroica townsendi	Townsend's warbler	d	M5
		Geothlypis trichas	Common yellowthroat	d	S5
		Wilsonia pusilla	Wilson's warbler	d	S5, M5
		Icteria virens	Yellow-breasted chat	d	S5
		Piranga ludoviciana	Western tanager	d	S3, M3
		Pheucticus melanocephalus	Black-headed grosbeak	sw	S5, M5
		Icterus galbula	Northern oriole	d	S3, M3
		Picoides pubescens	Downy woodpecker	d	B5, M5
		Colaptes auratus	Northern flicker	d	B3, M3
Aves	AV222	*Larus pipixcan*	Franklin's gull	w, ss	S3, M3
		Larus californicus	California gull	w, ss	S5, M3
		Sturnus vulgaris	European starling	sw	R3
		Troglodytes aedon	House wren	d	R3
		Sialia currucoides	Mountain bluebird	ss	S3, M3
		Turdus migratorius	American robin	sw	B2, M2
		Oreoscoptes montanus	Sage thrasher	ss	B2, M2
		Passerina amoena	Lazuli bunting	d	S5, M5
		Spizella passerina	Chipping sparrow	f, d, ss	M5
		Spizella breweri	Brewer's sparrow	ss	B2, M2
		Amphispiza bilineata	Black-throated sparrow	ss	S5, M5
		Amphispiza belli	Sage sparrow	ss	B2, M2
		Passerculus sandwichensis	Savannah sparrow	d, g	S5, M3
		Zonotrichia leucophrys	White-crowned sparrow	ss	M4
		Sturnella neglecta	Western meadowlark	g, ss	B2, M2, W3
		Euphagus cyanocephalus	Brewer's blackbird	sw	B2, M2, W5

Table A2-1. (continued).

Class	Functional Group	Taxonomic Name	Common Name	Distribution/ Status[a]	Abundance/ Season/status[b]
		Molothrus ater	Brown-headed cowbird	ss	B3, M3
		Charadrius vociferus	Killdeer	sw	B2, M2
		Anthus spinoletta	Water pipit	ss	M5
		Pipilo chlorurus	Green-tailed towhee	ss	S3, M3
		Pipilo erythrophthalmus	Rufous-sided towhee	sw	S3, M3
		Pooecetes gramineus	Vesper sparrow	g, ss	B3, M3
		Calamospiza melanocorys	Lark bunting	ss	S5, M5
		Melospiza melodia	Song sparrow	d	S5, M3
Aves	AV222A	*Salpinctes obsoletus*	Rock wren	ss	B3, M3
		Catherpes mexicanus	Canyon wren	ss	S5, M5
Aves	AV232	*Agelaius phoeniceus*	Red-winged blackbird	w, ss	B3, M3
		Xanthocephalus xanthocephalus	Yellow-headed blackbird	w, d	B4, M3
Aves	AV310	*Accipiter striatus*	Sharp-shinned hawk	sw	S5, M5, W5
		Accipiter cooperii	Cooper's hawk	sw	S3, M5, W5
		Accipiter gentilis	Northern goshawk	sw	S5, M5, W5
		Falco columbarius	Merlin	sw	R5
		Falco peregrinus	Peregrine falcon	sw	S5, M5, W5
		Falco mexicanus	Prairie falcon	sw	R3
Aves	AV322	*Nyctea scandiaca*	Snowy owl	sw	W5
		Haliaeetus leucocephalus	Bald eagle	sw	M5, W3
		Falco sparverius	American kestrel	sw	B2, M2, W3
		Circus cyaneus	Northern harrier	sw	R2
		Buteo swainsoni	Swainson's hawk	sw	B3, M3, W5
		Buteo jamaicensis	Red-tailed hawk	sw	B3, M3, W5
		Buteo regalis	Ferruginous hawk	sw	B3, M3, W5
		Lanius excubitor	Northern shrike	sw	M3, W5
		Lanius ludovicianus	Loggerhead shrike	ss	B3
		Bubo virginianus	Great horned owl	sw	R3
		Asio otus	Long-eared owl	d	B4, M4
		Asio flammeus	Short-eared owl	ss, g	B3, M3
		Aegolius acadicus	Northern saw-whet owl	sw	S6, M6, W6
		Aquila chrysaetos	Golden eagle	sw	B3, M4, W2

Table A2-1. (continued).

Class	Functional Group	Taxonomic Name	Common Name	Distribution/ Status[a]	Abundance/ Season/status[b]
		Cathartes aura	Turkey vulture	sw	S3, M3, W6
		Buteo lagopus	Rough-legged hawk	sw	S6, M2, W2
Aves	AV322A	*Athene cunicularia*	Burrowing owl	ss, g	B3, M3, W6
Aves	AV422	*Aphelocoma coerulescens*	Scrub jay	U	U
		Pica pica	Black-billed magpie	sw	R2
		Corvus brachyrhynchos	American crow	sw	R3
		Phasianus colchicus	Ring-necked pheasant	g, ss	R3
		Corvus corax	Common raven	sw	R3
		Larus argentatus	Herring gull	w, ss, g	S3, M3
Aves	AV432	*Larus delawarensis*	Ring-billed gull	w, ss, g	S3, M3
Mammalia	M121	*Erethizon dorsatum*	Porcupine	r, f	I4
Mammalia	M122	*Lepus townsendii*	White-tailed jackrabbit	sw, ss	R4
		Lepus californicus	Black-tailed jackrabbit	sw, ss	R1,R4 (cyclic)
		Reithrodontomys megalotis	Western harvest mouse	sw, ss, g	R2
		Cervus elaphus	Elk	sw	R4
		Odocoileus hemionus	Mule deer	sw, ss, g	R3
		Antilocapra americana	Pronghorn	sw, ss, f	R1
Mammalia	M122A	*Sylvilagus nuttallii*	Nuttall's cottontail	sw, ss, f	R2
		Brachylagus idahoensis	Pygmy rabbit	ss, ro	R2
		Marmota flaviventris	Yellow-bellied marmot	sw, ro	R3
		Spermophilus townsendii	Townsend's ground squirrel	sw, ss, f	R2
		Perognathus parvus	Great basin pocket mouse	sw, ss	R3
		Dipodomys ordii	Ord's kangaroo rat	sw, ss, g	R2
		Neotoma cinerea	Bushy-tailed woodrat	sw, ro	R2
		Microtus montanus	Montane vole	sw, g, f	R1,R4 (cyclic)
		Lagurus curtatus	Sagebrush vole	ss	R3
Mammalia	M123	*Thomomys talpoides*	Northern pocket gopher	ss	R4
Mammalia	M210	*Lasiurus cinereus*	Hoary bat	d, j	U3
		Lasionycteris noctivagans	Silver-haired bat	sw	M4
Mammalia	M210A	*Myotis leibii*	Small-footed myotis	sw, ro	R2

Table A2-1. (continued).

Class	Functional Group	Taxonomic Name	Common Name	Distribution/ Status[a]	Abundance/ Season/status[b]
		Eptesicus fuscus	Big-brown bat	sw, f, c	R3
		Plecotus townsendii	Townsend's western big-eared bat	sw, c	R2
		Myotis lucifugus	Little brown myotis	sw, f	I2
		Myotis evotis	Long-eared myotis	Southeast INEEL	U2
		Myotis leibii	Small-footed myotis	sw, ro	R2
		Myotis californicus	California myotis	sw	U2
Mammalia	M222	*Sorex merriami*	Merriam's shrew	sw, ss	R4
		Onychomys leucogaster	Northern grasshopper mouse	sw, ss	R4
Mammalia	M322	*Mustela frenata*	Long-tailed weasel	sw, ss	R2
		Taxidea taxus	Badger	sw	R3
		Canis lupus	Wolf	Unknown	Rare
		Felis rufus	Bobcat	sw, ss, j	R4
Mammalia	M422	*Tamias minimus*	Least chipmunk	sw, ss	R1
		Peromyscus maniculatus	Deer mouse	sw	R1
		Rattus norvegicus	Norway rat	NW/NE INEEL; ag	R5 (?)
		Mus musculus	House mouse	f	R5 (?)
		Spilogale gracilis	Western spotted skunk	sw, ro	R5
Mammalia	M422A	*Canis latrans*	Coyote	sw	R2
Reptilia	R222	*Phrynosoma douglasii*	Short-horned lizard	sw, ss	R1
		Sceloporus graciosus	Sagebrush lizard	sw, ss	R1
		Eumeces skiltonianus	Western skink	South INEEL	R5
Reptilia	R322	*Masticophis taeniatus*	Desert striped whipsnake	NE INEEL, ss	R3
		Pituophis melanoleucus	Gopher snake	sw, ss	R2
		Thamnophis elegans	Western garter snake	sw	R3
		Coluber constrictor	Western racer	sw	I5
		Crotalus viridis	Western rattlesnake	sw, ss	R2

a.
w	On or near water
ss	Shrub-steppe
d	Deciduous or riparian
j	Juniper woodland
g	Grassland
sw	Sitewide
f	Facility complexes
c	Cave
ro	rocky outcrop
U	Unknown
r	Riparian
ag	Agricultural area

Table A2-1. (continued).

	Class	Functional Group	Taxonomic Name	Common Name	Distribution/ Status[a]	Abundance/ Season/status[b]
b.	1	Abundant—very numerous and certain to be seen or sampled				
	2	Common—likely but not certain to be observed or sampled				
	3	Uncommon—found in limited numbers, not likely to be sampled or observed				
	4	Occasional or local—a species that is not always present or is restricted in distribution				
	5	Rare—a species that has a range including all or part of INEEL, but has been documented ≤ seven times on INEEL				
	6	Vagrant or accidental—a species that is not expected to occur on INEEL, but has been recorded there				
	7	Possible occurrence—species for which sightings have been unverified or geographical range overlaps INEEL (and preferred habitat occurs on INEEL.				
	R	Breeder and year-round resident				
	B	Summer breeder				
	M	Migrant				
	I	Incidental species				
	W	Winter visitor				
	S	Summer visitor: no breeding records				
	U	Unknown				

Table H6-2--2. Functional groups and species not included in the literature search or individually evaluated for the WAG ERAs.

Functional Group	Common Name	Habitat[a]	Abundance/ Seasons[b]	Regulatory Status[c]	Criteria for Exclusion
A232	Great basin spadefoot toad	w	R2		Geographic—aquatic, sinks, and spreading areas
	Boreal chorus frog	W	R4		Geographic—aquatic
	Western toad	w,d	U7		Incidental species
AV122	Black-chinned hummingbird	ag,d	U7		Possible but not recorded on INEEL
	Calliope hummingbird	ag,d	U7		Possible but not recorded on INEEL
	Sharp-tailed grouse	g, ss	I6		Incidental species
AV122	Broad-tailed hummingbird	ag,d	U7		Possible but not recorded on INEEL
	Blue grouse	F	S6		Vagrant species
AV142	Snow goose	W	M5		Geographic—on or near water
	Green-winged teal	W	S5, M5		Geographic—on or near water
	Redhead	W	S5, M5, W5		Geographic—on or near water
	Ring-necked duck	W	S5, M5		Geographic—on or near water
AV143	Tundra swan	W	M5		Geographic—on or near water
	Canada goose	W	S3, M3		Geographic—on or near water
	Mallard	W	B2, M2, W3		Geographic—on or near water
	Northern pintail	W	S3, M3		Geographic—on or near water
	Blue-winged teal	W	B2, M3		Geographic—on or near water
	Cinnamon teal	W	S3, M3		Geographic—on or near water
	Northern shoveler	W	B3, M3		Geographic—on or near water
	Gadwall	W	S3, M3		Geographic—on or near water
	American wigeon	W	S3, M3		Geographic—on or near water
	Canvasback	W	B5, M5		Geographic—on or near water
	Ross' goose	W	I6		Incidental species
	White-fronted goose	W	I6		Incidental species
AV210	Gray flycatcher	g,ss,j	U7		Incidental species
	Western wood-pewee	D	I6		Incidental species
	Willow flycatcher	D	U7		Incidental species
	Dusky flycatcher	D	U7		Incidental species
	Common poor-will	J	I6		Incidental species
AV221	Black-and-white warbler	U	I6		Incidental species
	Swainson's thrush	U	I6		Incidental species
	Blue-gray gnatcatcher	U	I6		Incidental species
	Red-naped sapsucker	U	I6		Incidental species
	Lewis' woodpecker	U	I6		Incidental species
	MacGillivray's warbler	U	I6		Incidental species
	Orange-crowned warbler	U	I6		Incidental species

Table A2-2. (continued).

Functional Group	Common Name	Habitat[a]	Abundance/ Seasons[b]	Regulatory Status[c]	Criteria for Exclusion
	American redstart	F	M6		Vagrant species
	Mountain chickadee	d,j	U7		Incidental species
	Lapland longspur	g,ss	U7		Incidental species
	Hairy woodpecker	ag,d	U7		Incidental species
	Black-capped chickadee	d,j	U7		Incidental species
AV222	Varied thrush	Ss	W6		Vagrant species (winter)
	Flammulated owl		I6		Incidental species
	Harris' sparrow		I6		Incidental species
	Hermit thrush		I6		Incidental species
	Lincoln's sparrow		I6		Incidental species
	Northern mockingbird	J	S6		Geographical—juniper woodland habitat
	Lapland longspur	g,ss	I7		Incidental species
	Western sandpiper	W	I6		Incidental species
	Semipalmated plover	W	I6		Incidental species
AV232	Virginia rail	W	U7		Incidental species
	Marsh wren	W	U7		Incidental species
	Baird's sandpiper	W	I6		Incidental species
	Mountain plover	U	I6		Incidental species
	Orchard oriole	U	I6		Incidental species
	Spotted sandpiper	W	S3, M3		Geographic—on or near water
	Least sandpiper	W	S5, M5		Geographic—on or near water
AV233	Cattle egret	W	I6		Incidental species
	Black-necked stilt	W	I6		Incidental species
	Snowy egret	w	I6		Incidental species
	Solitary sandpiper	w	S5, M3		Geographic—on or near water
	Marbled godwit	w	S3, M5		Geographic—on or near water
	Long-billed dowitcher	w	M5		Geographic—on or near water
	Common snipe	w	S5, M5		Geographic—on or near water
	White-faced ibis	w	S5, M5		Geographic—on or near water
	Long-billed curlew	w	S3, M3		Geographic—on or near water
AV241	Wood duck	w	S6, M5		Geographic—on or near water
	Red-necked phalarope	w	M5		Geographic—on or near water
	Wilson's phalarope	w	S3, M3		Geographic—on or near water
AV242	Surf scoter	w	I6		Incidental species
	Barrow's goldeneye	w	S6, M5		Vagrant species
	Lesser scaup	w	S5, M3, W3		Geographic—on or near water
	Common goldeneye	w	S5, M3, W3		Geographic—on or near water
	Barrow's goldeneye	w	S6, M5		Geographic—on or near water
	Ruddy duck	w	B5, M3		Geographic—on or near water
	Lesser yellowlegs	w	S5, M5		Geographic—on or near water

Table A2-2. (continued).

Functional Group	Common Name	Habitat[a]	Abundance/ Seasons[b]	Regulatory Status[c]	Criteria for Exclusion
	Bonaparte's gull	w	M5		Geographic—on or near water
	Bufflehead	w	S5, M3		Geographic—on or near water
	Pied-billed grebe	w	S5, M5		Geographic—on or near water
	Horned grebe	w	M5		Geographic—on or near water
	Eared grebe	w	B5, M3, W3		Geographic—on or near water
AV310	Gyrfalcon	sw	M6	SSC,S	Incidental species
AV322	Northern pygmy owl	d	U7	SSC	Incidental species
	Boreal owl		I6		Incidental species
	Western screech owl	d	U7		Incidental species
AV332	Northern saw-whet owl	sw	S6, M6, W6		Vagrant species
AV333	Green-backed heron	w	S6, M6		Vagrant species
AV342	Red-breasted merganser	w	I6		Incidental species
	Black-legged kittiwake	w	W6		Vagrant species (winter)
AV422	Hooded merganser	w	I6		Incidental species
	Double-crested cormorant	w	I6		Incidental species
	Blue jay	U	I6		Incidental species
	Clark's nutcracker	j	S4, M4, W5		Geographical—juniper woodland habitat
AV432	American avocet	w	S2, M3		Geographic—on or near water
AV433	Sandhill crane	U	I6		Incidental species
	Great egret	w	S5, M5		Geographic—on or near water
AV442	American coot	w	R3		Geographic—on or near water
M122	Moose	sw	T6		Transient species - Rare
	Mountain sheep	N INEEL	T6		Transient species - Rare
M132	Muskrat	w	S5,W5 (cyclic)		Geographical—aquatic habitat (Big Lost River)
	Beaver	w	R4,S,W		Geographical—aquatic habitat (Big Lost River)
M210	Yuma myotis	sw	U7		Incidental species
	Silver-haired bat	sw	U7		Incidental species
	Western pipistrelle	sw	U7	C2,SSC,S	Incidental species
	Fringed myotis	sw	U7	SSC	Incidental species
M210A	Long-legged myotis	sw	U7		Incidental species
	Pallid bat	sw	U7		Incidental species
M322	Mountain lion	sw	T6		Transient species—Rare
	Striped skunk	ag,d	U7		Incidental species
	Short-tailed weasel (ermine)	ag,d	U7		Incidental species
	Red fox	ag,d	U7		Incidental species
M422	Racoon	ag,d	U7		Incidental species
O242	Shorthead sculpin	w	R2		Geographical—aquatic species (Big Lost

Table A2-2. (continued).

Functional Group	Common Name	Habitat[a]	Abundance/ Seasons[b]	Regulatory Status[c]	Criteria for Exclusion
					River)
O243	Mountain whitefish	w	R2		Geographical—aquatic species (Big Lost River)
	Speckled dace	w	R3		Geographical—aquatic species (Big Lost River)
	Cutthroat trout	w	U7		Geographical—aquatic species (Big Lost River)
O342	Rainbow trout	w	R2		Geographical—aquatic species (Big Lost River)
	Brook trout	w	R3		Geographical—aquatic species (Big Lost River)
	Utah chub	w	U7		Geographical—aquatic species (Big Lost River)
O442	Kokanee salmon	w	M3		Geographical—aquatic species (Big Lost River)
R222	Leopard lizard	NE INEEL	R4		Geographical—observations restricted to NE INEEL
R232	Tiger salamander	w	U7		Incidental species
R322	Rubber boa	U	I6		Incidental species
	Ringneck snake	sw	U7	NL,SSC	Incidental species
	Common garter Snake	sw	U7		Incidental species
	Night snake	sw	U7	S	Incidental species

a. ag Agriculture
w On or near water
ss Shrub-steppe
d Deciduous or riparian
j Juniper woodland
g Grassland
sw Sitewide
f Facility complexes
U Unknown
r Riparian

b. 1 Abundant—very numerous and certain to be seen or sampled.
2 Common—likely but not certain to be observed or sampled.
3 Uncommon—found in limited numbers, not likely to be sampled or observed.
4 Occasional or local—a species that is not always present or is restricted in distribution.
5 Rare—a species that has a range including all or part of INEEL, but has been documented ≤ seven times on INEEL.
6 Vagrant or accidental—a species that is not expected to occur on INEEL, but has been recorded there.
7 Possible occurrence—species for which sightings have been verified or geographical range overlaps INEEL (and preferred habitat
R occurs on INEEL)
I Breeder and year-round resident.
M Incidental.
W Migrant.
S Winter visitor.
T Summer visitor—no breeding records.
U Transient.
Unknown

c. Species management codes for federal (FED) listing, Bureau of Land Management (BLM), U.S. Forest Service Region 4 (USFS), and Audubon Blue List (AUDBL): C2 = category 2 species; 3c = no longer considered for listing; E = endangered species; NL = not listed; SSC = species of special concern; T = threatened species; S = sensitive.